Poplars That Cope With Salty Water

Fast-growing hybrid poplars—leafy, attractive relatives of cottonwoods and aspens—can suck up leftover water drained from irrigated farmlands. This could lessen the need for farmers to build and maintain evaporation ponds. And the trees might provide a new source of cash.

Evaporation ponds burden growers and the environment alike. A 1-acre evaporation pond for drainage disposal is needed for every 10 irrigated acres in some parts of California, for instance.

But which poplars might make the best water blotters? Scientists with the Agricultural Research Service in California pinpointed some top candidates in an experiment with eight different kinds of hybrid poplars.

The idea of using hybrid poplars to recycle water from farms, factories, or sewage treatment plants isn't new. But the ARS study is among the first to scrutinize the hybrids' ability to withstand chloride salt, boron, and selenium in amounts sometimes present in irrigation drainage water.

Conducting the experiment were Michael C. Shannon and John H. Draper of ARS at Riverside, California; Gary S. Bañuelos and Husein A. Ajwa with ARS at Fresno, California; and James L. Jordahl of CH2M Hill in Portland, Oregon. The scientists used hybrid poplars furnished by Louis A. Licht of Ecolotree, Inc., in Iowa City, Iowa.

The hybrids—offspring of two different poplar species—are usually more robust than either parent. Some hybrids can grow nearly 100 feet tall in 6 to 8 years, whereas regular poplars might take two or three times as long to reach that height.

Scientists planted poplar cuttings about 6 inches long outdoors at the U.S. Salinity Laboratory in Riverside. When the study ended 5 months later, the trees averaged 6 feet.

Salinity of water that was piped to the cuttings ranged from 400 to 14,000 parts per million, or "about that of tap water to about one-third as salty as seawater," says lab director Shannon.

Boron and selenium levels were low to moderately high, according to Bañuelos, a soil scientist with the ARS Water Management Research Laboratory in Fresno.

The most salt-tolerant poplars were hybrids known as 49177 and DN-34. Surprisingly, they appeared to use different salt-coping strategies.

"Hybrid 49177," says Shannon, "had the highest growth rate, so it had more leaves and other natural sinks to store salt in. DN-34 apparently had a root-level mechanism that restricted salt uptake in the trunk."

Hybrid 49177, Bañuelos reports, accumulated the most boron. Another hybrid, number 50194, took up the most selenium and was moderately salt-tolerant.

Shannon notes that hybrid poplars are less tolerant of salt than eucalyptus, another extremely fast-growing species sometimes chosen for water re-use.

"But there's more of a market for hybrid poplar than eucalyptus," says Shannon. "Hybrid poplar is made into everything from toothpicks to high-quality veneers and papers."

In the future, after drainwater is used for on-farm plantations of poplars, secondary drainage from the poplars may be recycled onto small fields of salt-tolerant plants—or halophytes—such as salt grass.

"With each step in this recycling sequence," says Shannon, "you've decreased the volume of drainage water that you have to deal with, but you've increased the saltiness. That's why you need a halophyte."

Bañuelos points out another option: thickets of the thirsty trees might be irrigated with poor-quality well water pumped from natural aquifers. "That way," he says, "groundwater unfit for drinking because of the salt it contains could be used to grow a marketable crop."

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At 13 months, these salt-tolerant DN-34 poplar trees planted at Oremet Titanium, Inc., in Albany, Oregon, are already 12 feet tall.

"With either option," says Shannon, "you have to know which hybrids are the most salt tolerant. Our study shows some of the genetically controlled variability in the hybrids' capacities to tolerate salt or to take up or exclude boron or selenium. And it provides clues for future breeding to exploit these traits.

"Growers who recycle water to salt-tolerant poplars and then onto halophytes," Shannon says, "might tomorrow handle all of their farm drainwater with fewer and smaller evaporation ponds."—By **Marcia Wood,** ARS.

Michael C. Shannon is with the USDA-ARS U.S. Salinity Laboratory, 450 West Big Springs Rd., Riverside, CA 92507; phone (909) 369-4815, fax (909) 342-4960, e-mail mshannon@ussl.ars.usda.gov

Gary S. Bañuelos is with the USDA-ARS Water Management Research Laboratory, 2021 S. Peach Ave., Fresno, CA 93727; phone (209) 453-3115, fax (209) 453-3122, e-mail sdowney@asrr.arsusda.gov ◆